

DETAILED ACTION

Claim Rejections - 35 USC § 101

1. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1-12 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Regarding **claims 1-6**, the claimed inventions are method claims related calculating the number of motion vector candidates in video. They are neither attached to a statutory class, nor transformations.

Regarding **claims 7-12**, the claimed inventions are system claims corresponding to the method claims 1-6. However, since there is no physical entity in the claims, they could be method claims. Therefore, they are rejected for the same reason as above.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. **Claims 1-3, 6, 7-9, and 12** are rejected as being unpatentable over Feng (Electronics Letters 31st August, 1995, pp.1542-1543) in view of Fan (Optical Eng. 37(5), pp.1563-1570).

Regarding **claim 1**, Feng discloses Adaptive Block Matching Motion Estimation Algorithm for Video Coding. Feng specifically discloses A method for distributing candidate motion vectors (Adaptive Block Matching Motion Estimation Algorithm for Video Coding, pp.1542-1543), the method comprising: dividing a picture frame into a plurality of pixel blocks (Block-based coding, pp.1542, Firs col., Introduction); measuring local motion complexity (Displaced Block Difference, Eq.1) for each pixel blocks; and assigning a number of candidate motion vectors (Maximum displacement (motion search range determines the number of candidate vectors) to each motion class, pp.1542, second col., (ii) search range adaptation) to pixel blocks based on the measured local motion complexity (Three Motion classes - High, medium, low motion, depending on DBD, pp. 1542, second col., (ii) search range adaptation). However, Feng fails to disclose dividing a picture frame into a plurality of segments, each segment comprising a plurality of pixel blocks; measuring local motion complexity for each segment; assigning a number of candidate motion vectors to pixel blocks within each segment based on the measured local motion complexity.

In the same field of endeavor, Fan discloses Efficient Motion Estimation Algorithm Based on Structure Segmentation and Compensability Analysis. Fan specifically discloses dividing a picture frame into a plurality of segments, each segment comprising a plurality of pixel blocks (Structure Segmentation, pp.1564-1565, Structure

could be a background, moving object, uncovered background, edges), in order to do more efficient motion estimation based on structure segmentation (pp.1988, left col, 3rd paragraph).

Therefore, given this teaching, it would have been obvious to modify Feng by providing *dividing a picture frame into a plurality of segments, each segment comprising a plurality of pixel blocks*; measuring DBD for each segment by summing up block DBD's in a segment; assigning a search window (*number of candidate motion vectors*) to pixel blocks within each segment based on the measured segment DBD (*local motion complexity*), in order to do more efficient motion estimation based on structure segmentation. The Feng method, incorporating the Fan Structure Segmentation, further incorporating assigning the same search area (*number of candidate motion vectors*) to pixel blocks within each segment based on segment DBD, discloses all the features of claim 1.

Regarding **claim 2**, the Feng method, incorporating the Fan Structure Segmentation, further incorporating assigning the same search window to pixel blocks

within each segment based on segment DBD, as applied to claim 1, discloses wherein the step of measuring comprises:

determining a sum-of-absolute differences (Feng: Mean Absolute Difference, pp.1542, Equation 1) between pixel blocks of the picture frame (Feng: block being predicted by motion estimation in the present frame, pp.1542, paragraph after Eq.1), and corresponding pixel blocks of an adjacent frame (Feng: Candidate block within search area in the previous frame, pp.1542, paragraph after Eq.1), and

summing the measured sum-of-absolute differences (Feng: Equation 1) associated with of pixel blocks within each segment (Fan: Structure segmentation, pp.1564-1565).

Regarding **claim 3**, the Feng method, incorporating the Fan Structure Segmentation, further incorporating assigning the same search area to pixel blocks within each segment based on segment DBD, as applied to claim 1, discloses *wherein the step of assigning*

comprises using a distribution function (Examiner interprets as distributing the number of motion vectors according to Feng: pp.1542, second col., (ii) search range adaptation) *configured to assign the number of candidate vectors* (Feng: Maximum displacement (motion search range determines the number of candidate vectors) to each motion class, pp.1542, second col., (ii) search range adaptation) *based on the measured local motion complexity* (Feng: Three Motion classes - High, medium, low motion, depending on DBD, pp. 1542, second col., (ii) search range adaptation) *of each segment* (Fan: Structure segmentation, pp.1564-1565).

Regarding **claim 6**, it is inherent in the Feng method, incorporating the Fan Structure Segmentation, further incorporating assigning the same search area to pixel blocks within each segment based on segment DBD, as applied to claim 1, *further comprising performing motion estimation on the pixel blocks using the number of candidate vectors assigned to each pixel block*, because motion vector candidates in the search range (Feng: Maximum displacement (motion search range) to each motion class, pp.1542, second col., (ii) search range adaptation) will be tried to get the best matching block.

Regarding **claim 7**, the claimed invention is a system claim corresponding to the method claim 1. Therefore, it is rejected for the same reason as claim 1.

Regarding **claim 8**, the claimed invention is a system claim corresponding to the method claim 2. Therefore, it is rejected for the same reason as claim 2.

Regarding **claim 9**, the claimed invention is a system claim corresponding to the method claim 3. Therefore, it is rejected for the same reason as claim 3.

Regarding **claim 12**, the claimed invention is a system claim corresponding to the method claim 6. Therefore, it is rejected for the same reason as claim 6.

4. **Claims 4-5, and 10-11** are rejected as being unpatentable over Feng in view of Fan and further in view of Cohen (US 5,355,221) (hereafter referenced as Cohen).

Regarding **claim 4**, Feng and Fan discloses everything claimed as applied above (see claim 3). However, Feng and Fan fail to disclose wherein the distribution function is based on a maximum, minimum and average of the measured sum-of-absolute differences of the segments.

In the different field of endeavor, Cohen discloses Rough Surface Profiler and Method. Cohen specifically discloses quadratic fitting (pp.13, Equation 8) using 3 points, in order to interpolate any points in general (col.13, line 1-8).

Therefore, given this teaching, it would have been obvious to modify Feng and Fen by providing the quadratic function fitting to the distribution function based on the measured sum-of-absolute differences of the segments, in order to interpolate distribution function based on sum-of-absolute differences. However, Cohen fails to disclose that these 3 points are *maximum, minimum and average*. However, it would

have been obvious to choose *maximum, minimum and average*, in order to do better fitting of the quadratic function model based on a wide range of points.

Therefore, given this teaching, it would have been obvious to modify Feng and Fen by providing wherein the distribution function is based on a maximum, minimum and average of the measured sum-of-absolute differences of the segments, in order to do better fitting of the quadratic function model based on a wide range of points. The Feng method, incorporating the Fan Structure Segmentation, further incorporating assigning the same search area to pixel blocks within each segment based on segment DBD, further incorporating the Cohen quadratic fitting using 3 points (maximum, minimum, and average), discloses all the features of claim 4.

Regarding **claim 5**, Feng and Fan and Cohen discloses everything claimed as applied above (see claim 4). However, Feng and Fan and Cohen fail to disclose wherein the distribution function is further based on **predetermined values** for a maximum, minimum and average number of candidate vectors per block.

Cohen discloses that three coefficients for quadratic fitting are solved by 3 points (col.13, line 1-8). Cohen uses measured function values for these 3 points. However, they could be substituted by pre-determined values (some desired values for motion search range) too, in order to accommodate the real-time or hardware constraints of motion search range, because it was well-known that motion estimation is the most computational heavy operation.

Therefore, given this teaching, it would have been obvious to modify Feng and Fen and Cohen by providing wherein the distribution function is further based on

predetermined values for a maximum, minimum and average number of candidate vectors per block, in order to accommodate the real-time or hardware constraints of motion search range. The Feng method, incorporating the Fan Structure Segmentation, further incorporating assigning the same search area to pixel blocks within each segment based on segment DBD, further incorporating the Cohen quadratic fitting using 3 points (maximum, minimum, and average), further incorporating using predetermined values for the above 3 points, discloses all the features of claim 5.

Regarding **claim 10**, the claimed invention is a system claim corresponding to the method claim 4. Therefore, it is rejected for the same reason as claim 4.

Regarding **claim 11**, the claimed invention is a system claim corresponding to the method claim 5. Therefore, it is rejected for the same reason as claim 5.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure, because they are related to the subject matter such as De-interlacing video and Interpolating image.

- US 6,490,320: Vetro et al. disclose "Adaptable Bitstream Video Delivery System".

Art Unit: 2621

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to HEE-YONG KIM whose telephone number is (571)270-3669. The examiner can normally be reached on Monday-Thursday, 8:00am-5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marsha Banks-Harold can be reached on 571-272-7905. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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/HEE-YONG KIM/
Examiner, Art Unit 2621
/Marsha D. Banks-Harold/

Supervisory Patent Examiner, Art Unit 2621

/Andy S. Rao/
Primary Examiner, Art Unit 2621
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